Determinants of Bank Credit Risk: Empirical Evidence for Commercial Banks from Republic of North Macedonia

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Abstract

Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. The goal of credit risk management is to maximise a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters. The effective management of credit risk is a critical component of a comprehensive approach to risk management and essential to the long-term success of any banking organisation.We have to underline that the revenue of banks comes primarily from interest on loans and accordingly loans form a major source of credit risk.This study aimed to investigate the credit risk determinants in Republic of North Macedonia banking sector. We include bank-specific variables in the analysis, (bank profitability, bank liquidity, capital ratio , bank size, growth rate in loans) using a balanced panel dataset of seven commercial banks, which have published revised financial statement on the web site of Electronic reporting system from listed companies on Macedonian stock exchange, over the period 2013-2018. To provide complete analysis, this study employed three different estimation methods: pooled OLS, Fixed effect and GLS Random effect models.The findings revealed that, capital ratio, growth rate in loans, bank size and bank liquidity, have significant correlation with credit risk. Capital ratio, growth rate in loans, and bank liquidity have inverse or negative correlation with credit risk, which means that if this variables increase the credit risk will decrease. Bank size has positive correlation with credit risk, showing that the increase of the bank size will increase credit risk. Our research doesn't find significant correlation between credit risk and bank profitability variable. This fact shows that the bank profitability in the case of banking sector in the Republic of North Macedonia has no statistical significance for the credit risk.

Kew words: balanced panel dataset, bank-specific variables, banking sector in the Republic of North Macedonia , credit risk determinants, non performing loans

1. Introduction

The main function of commercial banks is to finance the economy by granting credit to the different actors of economic life. Thus, banks provide the function of intermediation between agents with surplus funds and those with funding deficits. Therefore, efficient intermediation of commercial banks is vital especially for developing economies, in order to achieve high economic growth, while insolvency of them leads to economic crisis. However, intermediation function of commercial banks gives rise to different types of risks with different magnitudes and level of causes on bank performance, such as: credit risk, liquidity risk, market risk, operational risk, etc.

Credit risk arises from the potential that a borrower or counterparty will fail to perform on an obligation. For most banks, loans are the largest and most obvious source of credit risk. Credit risk is very important to financial institutions, especially in the present time where cash is not only limited only to paper, but the value of currencies and commodities is of invisibility like crypto currencies. Furthermore, it can be understood that credit risk is a potential opportunity for the borrower to fail to pay the loan to the financial institution at a predetermined timeframe.

Commercial banks exists not only to accept deposits, but also to grant credit facilities, therefore they are inevitably exposed to credit risk. Credit risk is the most significant risk faced by banks and the success of their business depends on accurate measurement and efficient management of this risk to a greater extent than any other risks.[1] Among these problems, credit risk is regarded as an important issue that may cause financial instability and threaten the survival of the business. This type of risk is inherent in the traditional function of banks, which is mainly based on granting credit. The lending process may result a serious problems, particularly non-performing loans, commonly known as credit risk. “Non-performing loans (NPLs) are known as bad debt where the borrowers are unable to make scheduled payments for a specific period, usually, when payments past due more than 90 days” [2] “Credit risk is a losses from the refusal or inability of credit customers to pay what is owed in full and on time”[3]. Another definition of credit risk is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk) [4]. Credit evens usually include events such as bankruptcy, failure to pay a due obligation, or credit rating change. Recently, non-performing loans (NPL) has received more attention from academic, policy makers and practitioners, since the increasing rate of these loans are cited among the main causes of financial crisis and collapse in financial institutions.

The reminder of this paper is structured as follows. Following this introduction, section 2 present literature review, section 3 presents data and methodology. In section 4 we present the results of three regression model and decide which one is appropriate for our analysis. The main results and discussions are presented in section 5 and the final section concludes the study.

2.Literature review

There are lot of empirical studies which analyze factors that may influence credit risk. In general, there are two kinds of factors. The first one is related to the bank specific variables, which is also known as internal factors. The second type is related to the macro variables or

what is known as external factors. Bank size, profitability, capital ratio inefficiency, bank liquidity and growth in credit, are usually used as a bank specific variables which have influence on credit risk. On the other hand, inflation, unemployment, GDP growth, are main macroeconomic variables which can affect credit risk.

There are research that examined the effect of macroeconomic and individual bank level variables of problem loans in Spanish commercial and savings banks over the period 1985–1997.The main focus in these researches was given on the importance of individual bank factors, such as growth policies and managerial incentives. The GDP growth rate, family indebtedness, rapid credit expansion, inefficiency, portfolio composition, size (total assets), net interest margin, capital ratio, and market power are variables that explain credit risk [5]. Another research conducted in the United States during 1980s determine the factors that have affected the profitability of banks, using both cross-sectional and pooled time-series regressions. It indicate that there is a negative relationship between credit risk and profitability, and that large commercial banks achieved poor results because of the declining quality of the loan portfolio [6].

There is a research which examine the determinants of credit risk in commercial banks in Bosnia and Herzegovina used the method of panel data. The findings of this study showed that banking credit risk is significantly negatively affected by inefficiency and credit growth [7].

In case of the Mexican banking sector, researches found that the higher the proportion of non-performing loans to total loans, the greater is the probability of banking failure [8]. Furthermore in Spanish banking sector, credit risk was significantly influenced by individual bank-level variables, after controlling for macroeconomic conditions [9].

The research made in Tunisian banking sector examine macroeconomic variables, precisely the real GDP growth rate, inflation rate and the real lending rate (RLR). The results show that these variables have an effect on the level of NPLs. Then, performance (measured by ROE) and inefficiency are determined by dividing the operating expenses by the operating income, known as bank-specific variables, have an additional explanatory power when incorporated in the baseline model. These variables support the ‘bad management’ hypothesis which links these indicators to the quality of management [10]. The empirical findings for Jordanian commercial banks show that there is a positive effect of the credit risk indicators of non-performing loans/gross loans ratio on financial performance, and a negative effect of provision for facilities loss/ net facilities ratio on financial performance, and no effect of the capital adequacy ratio and the credit interest/credit facilities ratio on banks’ financial performance when measured by ROA [11]. Interesting study had been made in two euro area countries examine the determinants of non-performing loans (NPLs) of commercial banks in a market-based economy, represented by France, compared with a bank-based economy, represented by Germany, during 2005–2011. The paper is motivated by the hypothesis that macroeconomic and bank-specific variables have an effect on loan quality, and that these effects vary between different banking systems. The key question discussed is which credit risk determinants are important for both countries. The results indicate that except for the inflation rate, the set of macroeconomic variables used in the paper influence the NPLs of both economies. This result is explained by the fact that both economies belong to the same euro area. Additionally, the study finds that compared to Germany, the French economy is more susceptible to bank-specific determinants. This highlights the impact of the type of economy (bank-based or market-based) on credit risk[12].

Another research examines credit risk of Beninese banks. It used a sample of seven commercial banks and tested the simultaneous effect of external and internal factors on credit risk over the period 2004-2013. After an econometric analysis on panel data (fixed effect model), it appears that the "growth of GDP", "interest margin" and the "proportion of institutional administrator" are the determinants of credit risk. Therefore, political authorities and bank officials could improve credit risk management by issuing policies on these factors [13]. A study which examine determinants of non-performing loans in Jordanian banks in the period 2007-2012, found that among bank specific factors, the lagged NPLs and the ratio of

loans total assets were the most important factors that affect nonperforming loans positively. However, contrary to international evidence, the result of this study show that large banks are not necessarily more effective in screening loan customers when compared to their smaller counterparts. With respect to the impact of macroeconomic factors on nonperforming loans, analyzes had found that economic growth and inflation rate have a negative and significant effect on non-performing loans. Global financial crisis showed a positive and significant effect on non performing loans indicating that the crisis lead to higher non-performing loans in Jordan[14].

The main objective of this study is to examine determinants of credit risk in the banking sector of the Republic of North Macedonia. This study investigated bank-specific variables such as: bank profitability, bank liquidity, bank capital, bank size and growth rate in credit .

3.Data And Methodology

The sample for the present study included seven out of fifteen commercial banks which have published revised financial statement on the web site of Electronic reporting system from listed companies on Macedonian stock exchange over the period 2013-2018: NLB Banka AD Skopje, Komercijalna Banka AD Skopje, Stopanska Banka AD Skopje, Stopanska Banka AD Bitola, TTK Bank AD Skopje, Centralna kooperativna banka AD Skopje and Univerzalna Investiciona Banka AD Skopje. Out of this seven banks three of them (NLB Banka AD Skopje, Komercijalna Banka AD Skopje, Stopanska Banka AD Skopje) are big banks according to total assets and total deposits.

Dependent Variable

As a dependent variable we use credit risk, measured as a total accounting amount of receivables with credit risk less impairment and special reserve. We take the data from the notes to the financial statements –managing risks from the revised financial statements.On the chart below we present credit risks in the analyzed banks in the period 2013-2018.

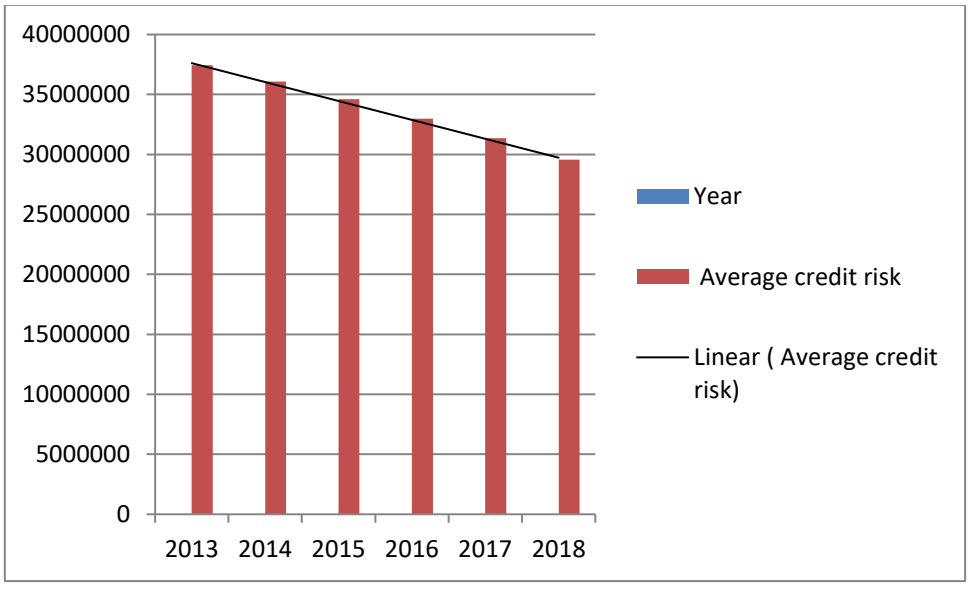

Figure 1. Credit risk in Macedonian banking sector (2013-2018) [15]

As we can see from the chart the level of total accounting amount of receivables with credit risk less impairment and special reserve, as a measure of credit risk tend to decline over the analyzing period.

Independent Variables

The independent variables in this study are bank specific variables. The selection of bank specific variables are based on the prior literature, where the most cited variables that have an effect on non-performing loans are: bank profitability, bank liquidity, capital ratio bank size and growth rate in loans.

Table 1. Variables definitions and measurement

Variable	***Definition***
Dependent variable	
Credit risk	Total accounting amount of receivables with credit risk less impairment and special reserve.
Independent variables	
Bank profitability	Measured as return on assets by taking the percentage of net profit after tax to total assets.
Bank liquidity	Measured as total loans divided by total deposits.
Capital Ratio	Measured as total equity to total assets
Bank Size	Measured as natural logarithm of total assets
Growth rate in loans	Measured as the difference between current year loans and previous year loans divided by previous year loans.

4. Regression Model

To provide complete analysis, this study employed three different estimation methods: pooled OLS, fixed effect and GLS random effect models.

The major problem with pooled OLS is that this model does not distinguish between the various banks that we have in our observation. In other words, by combining seven banks by pooling we deny the heterogeneity or individuality that may exist among seven banks.

Fixed Effect Model allows for heterogeneity or individuality among seven banks, by allowing to have its own intercept value.

In Random Effect model seven banks have common mean value for intercept.

Below we present the results of estimation of our three models.

Table 2 Regression Results

Variable	*Pooled OLS*	*Fixed Effect*	*Random Effect*
Constant	-2.53E+08 (0.0005)***	-3.46E+08 (0.4252)	-2.53E+08 (0.0007)***
Bank Liquidity	-1089208. (0.0001)***	-1422263. (0.0634)*	-1089208 (0.0002)***
Bank Profitability	703229.6 (0.8180)	-2460372. (0.6186)	703229.6 (0.8239)
Bank Size	52282454 (0.0000)***	69095786 (0.2835)	52282454 (0.0000)***

Capital Ratio	-233875.6 (0.0294)	-309220.5 (0.0156)**	-233875.6 (0.0347)**
Growth rate in loans	-769129.9 (0.0007)***	-823382.7 (0.0083)***	-769129.9 (0.0010)***

*** significance of 1 %
** significance of 5 %
*significance of 10%

After estimating these models, we shall have to decide which model (Fixed or Random model) is good to accept. To check it we will apply the Hausman Test, where:

Null Hypothesis: Random-effect model is appropriate
Alternative hypothesis: Fixed-effect mode is appropriate

If we get a statistically significant p-value, Fixed effect model will be appropriate one, otherwise Random effect model/
Below we present the results from Hausman test:

Table 3. Correlated Random Effects – Hausman Test

Test Summary	Chi-Sg. Statistic	Chi-Sg. d.f.	Prob.
Cross-section random	3.5776534	5	0.6118

As we can see, p-value is not significant, which means that Random effect is appropriate model .
After we approve with Hausman test that Random effect model is appropriate instead of Fixed effect model, we will check which model fit the best, between Random effect model and Pooled regression model using dummy variables. If all dummy variables are zero, that means Pooled Regression model is appropriate one, otherwise, Random effect model. We use Wald *test* for this estimation, where:

Null hypothesis: Pooled regression model is appropriate
Alternative hypothesis: Random Effect model is appropriate

Table 4. Wald Test

Test Statistic	Value	df	Probability
F-statistic	2.357167	(3,26)	0,0949
Chi-square	7.071501	3	0,0697

With 90% confidence we can accept alterative hypothesis that Random Effect model is appropriate

5. Discussion of the estimated results

After we confirmed that Random effect model is appropriate model we will discuss and analyze the results estimated with this model.

According to the presented results in the Table 2, we can conclude that bank liquidity variable is highly significantly. The coefficient indicator has a negative sign, which indicates that if bank liquidity increase, the credit risk will decrease.

The variable bank size is also highly significant variable which affect credit risk. The coefficient sign is positive, showing that the increase of the bank size will increase credit risk.

The variable capital ratio indicates negative and significant relation, showing inverse correlation, which means if capital ratio increase credit risk will decrease.

Growth rate in loans is also significant and has inverse correlation with credit risk.

Bank profitability variable is positive, but not significant. This fact shows that the bank profitability in the case of commercial bank in the Republic of North Macedonia, has no statistical significance for the credit risk. This result is opposite to the importance of profitability in reducing credit risk.

6.Conclusion

A high rate of non-performing loans in a bank will bring negative effect to the bank performance by reducing the liquidity of the bank. The non-performing loans are considered as the illiquidity assets for bank which do not generate any income. “The illiquidity assets are known as the main cause that conducts to bank panic”[16] When the bank panic is incurred, depositors will try to withdraw all of their deposits from bank immediately and it cause liquidity problem to the bank. If the bank is unable to endure the large amount of withdrawal, then the bank will face the probabilities of bankruptcy. Hence, it is important for a bank to measure the non-performing loans in order to take action earlier and prevent any uncertainty happen.

Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. The goal of credit risk management is to maximise a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters.

The Basel Committee on Banking Supervision defines credit risk as the potential that a bank borrower, or counterparty, will fail to meet its payment obligations regarding the terms agreed with the bank. It could occur because of the following reasons:

- Inadequate income of borrowers
- Inadequate underwriting frameworks
- Business failure of the borrowers
- The unwillingness of the borrowers to repay

This study examined the main bank specific determinants that affect bank credit risk using a sample of commercial banks in the Republic of North Macedonia, over the period 2013-2018. The data are taken from the web site of Electronic reporting system from listed companies on Macedonian stock exchange. As a dependent variable we use credit risk measured as a total accounting amount of receivables with credit risk less impairment and special reserve. As a independent variables we use (bank profitability, bank size, bank liquidity, capital ratio and growth rate in loans.). To provide complete analysis, this study employed three different estimation methods: pooled OLS, Fixed effect and GLS Random effect models.Overall results of this paper revealed that capital ratio, growth rate in loans, bank size and bank liquidity, have significant correlation with credit risk, where capital ratio, growth rate in loans, and bank liquidity have inverse or negative correlation with credit risk, and bank size has positive correlation with credit risk. Our research doesn’t find significant correlation with credit risk and bank profitability.

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